

Resurrecting Ancient Life Forms. Yeast, Fruits, Mammals, and the Extinction of Dinosaurs

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One of the most significant recent transitions in the macrobiosphere occurred in the period of time when mammals replaced dinosaurs as the dominant large vertebrates. This transition was accompanied by a corresponding transition of the dominant macroflora from gymnosperms to angiosperms in many ecosystems. These transitions are not unrelated. Many of the taxa that survived the Cretaceous-Tertiary extinction ate the fruit and seeds of the angiosperms that emerged at the very end of the Jurassic, and generated fleshy fruits by the end of the Cretaceous. This is even true of the dinosaurs (birds) who survived. This transition extended to the microbiosphere world as well. Modern yeast living in fleshy fruit developed fermentation to exploit this resource by converting sugars into large amounts of alcohol. Fruit flies emerged to have larvae that eat the yeast in environments high in alcohol. To test a range of hypotheses connecting the plant, insect, mammal, and microbial worlds, we have resurrected in the laboratory the last common ancestor of Adh 1 and 2 in a paleobiochemistry experiment. The kinetic behavior of this enzyme, together with analysis of the yeast genome, suggest that the emergence of massive fermentation correlated with the emergence of the fruit. This generates a "planetary biology" perspective, one that recognizes that all sympatric taxa are part of a larger interacting system.